Basic Trigonometric Identities

Reciprocal Identities

$$\sin x = \frac{1}{\csc x} \qquad\qquad \csc x = \frac{1}{\sin x}$$

$$\cos x = \frac{1}{\sec x} \qquad\qquad \sec x = \frac{1}{\cos x}$$

$$\tan x = \frac{1}{\cot x} \qquad\qquad \cot x = \frac{1}{\tan x}$$

Quotient Identities

$$\tan x = \frac{\sin x}{\cos x} \qquad\qquad \cot x = \frac{\cos x}{\sin x}$$

Pythagorean Identities

$$\sin^2 x + \cos^2 x = 1 \qquad 1 + \tan^2 x = \sec^2 x \qquad 1 + \cot^2 x = \csc^2 x$$

Cofunction Identities

$$\sin\left(\frac{\pi}{2} - x\right) = \cos x \qquad\qquad \cos\left(\frac{\pi}{2} - x\right) = \sin x$$

$$\tan\left(\frac{\pi}{2} - x\right) = \cot x \qquad\qquad \cot\left(\frac{\pi}{2} - x\right) = \tan x$$

$$\sec\left(\frac{\pi}{2} - x\right) = \csc x \qquad\qquad \csc\left(\frac{\pi}{2} - x\right) = \sec x$$

Even/Odd Identities

$$\sin(-x) = -\sin x \qquad\qquad \csc(-x) = -\csc x$$

$$\cos(-x) = \cos x \qquad\qquad \sec(-x) = \sec x$$

$$\tan(-x) = -\tan x \qquad\qquad \cot(-x) = -\cot x$$

Sum and Difference Identities

$$\sin(u \pm v) = \sin u \cos v \pm \cos u \sin v \qquad \cos(u \pm v) = \cos u \cos v \mp \sin u \sin v$$

Double-Angle Identities

$$\cos 2x = \cos^2 x - \sin^2 x \qquad\qquad \sin 2x = 2\sin x \cos x$$

$$= 2\cos^2 x - 1$$

$$= 1 - 2\sin^2 x$$

Power-Reducing Identities

$$\sin^2 x = \frac{1 - \cos 2x}{2} \qquad\qquad \cos^2 x = \frac{1 + \cos 2x}{2}$$